



Original Communication

Two wheeler accidents on Indian roads – a study from Mangalore, India

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ABSTRACT

Introduction: The alarming increase in mortality and morbidity owing to road traffic accidents has been a matter of great concern globally. This study was undertaken to find the trend of two wheeler accidents over the five years (2000–2004) with respect to age and sex of the victim, type of injury sustained, type of vehicle involved and time distribution of accidents.

Methods: Data was retrospectively collected from the records at the Regional Transport Authority's office, office of superintendent of police and also from both the Traffic police stations of the Mangalore city. Results were tabulated and the analysis was done using SPSS version 10. Test of significance was applied and *p* value <0.05 was taken to be significant.

Results: A total of 1231 two wheeler accidents were recorded during 2000–2004. Majority (77%) of the victims were in the age group 18–44 years. Accident rate among males (83%) was higher than that among females (17%). Five percent of the victims (*n* = 75) succumbed to injuries, of whom 45 died on the spot. Geared vehicles (81%) were more commonly involved than those without gears. Highest number of accidents was seen during 6–10 pm.

Conclusion: There is considerable morbidity and mortality due to two wheeler road traffic accidents. Among the fatalities majority died at the spot. Hence first aid measures at the spot would be of great help. It is recommended to have a good support system and para medical training for the people manning the ambulance. Awareness should be created among general public. Besides, every road traffic injury case has medicolegal elements involved. In India, as per law, every road traffic injury case is registered as a medicolegal case and investigated for prosecution concerns and compensation needs.

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1. Introduction

Everyday as many as 140,000 people are injured on the world's roads; more than 3000 die and some 15,000 are disabled for life.¹ Intra-country or regional differences in patterns of injury by the road user type have significant implications for prevention policies.² The fatality and injuries in low and middle income (developing) countries and South East Asian countries in particular is high compared to the high income countries.¹ In India, it is estimated that one accident takes place every 2 min. Data from the National Crime Records Bureau indicates that deaths and injuries related to road traffic accident has increased two and four fold respectively during the period of 1991–2005. Reportedly 98,254 persons were killed in 2005 on Indian roads.³ Road use patterns in Indian cities

are very different from those in cities in highly industrialized countries. Pedestrians, two wheeler users, and bicyclists are considered as vulnerable road users.⁴ Two wheelers, motorized as well as non-motorized vehicles are the main components of Indian traffic.^{4–7} The occupants and riders of two wheeler vehicles are among the majority to be affected in road traffic accidents.^{4,8–10} Two wheeler accidents have also been shown to have maximum case fatality in accidents.^{1,10,11} The two wheeler users are directly exposed and come in direct contact with the impacting vehicle or obstacle during a collision resulting in severe injuries and fatality.⁴

Hospitals, medical centres and institutions, police records, and insurance data are some of the sources for data used globally with regard to road traffic injuries; the commonest being the police and hospitals.^{4,5,12,13} Although two wheelers comprise a major share of Indian traffic, there is paucity of literature on the pattern of two wheeler accidents. This study was undertaken to get an insight into the trend of two wheeler accidents in Mangalore, Southern India with respect to age and sex distribution of victims, type of injury

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sustained, type of vehicle involved, and the diurnal and seasonal distribution of accidents.

2. Methods

This study was conducted in the coastal city of Mangalore in Karnataka state of Southern India. Mangalore has a cosmopolitan population of about 0.42 million.¹⁴ The data for this study was collected retrospectively from three sources. Data regarding two wheeler accidents was collected from the records maintained at the office of Superintendent of Police, South Canara District. Information recorded in the registers of police at the East and West Traffic Police Stations was also collected to compile the relevant data. These two traffic police stations are the nodal points where all the road traffic accidents in the city of Mangalore are reported.

Data about two wheeler accidents was obtained regarding age and gender of the victims, time and place of accident, type of vehicle involved in the accident, the type of injuries sustained, type of road users (pedestrians, riders or pillions) and the outcome of the accident. The motorized two wheelers (MTWs) were further classified into the geared vehicles and ungeared vehicles. The former included both the motorcycles and scooters whereas the ungeared ones included mopeds, scooterettes and scooters with variomatic transmission. Data collected for each year was tabulated and entered into the computer using the Microsoft excel package for further analysis. It was analysed manually as well as using the SPSS package version 10. Test of significance was performed and p value <0.05 was taken to be significant.

3. Results

A total of 1231 two wheeler traffic accidents involving 1076 motorized two wheeler vehicles were recorded that resulted in injury to 1494 people during the five year period extending from 2000 to 2004. There were no mass disasters involving two wheelers. However, in 263 incidents there were two people involved whereas in 968 incidents only one victim was injured. Two wheeler accidents were responsible for 41.9% of the total accidents during the study period. The pattern of two wheeler accidents in Mangalore is depicted in Table 1. The rider was affected in maximum number of accidents (51.3%), the pillion and pedestrian were also affected, but to a lesser extent (Table 1). The type of two wheeler mainly involved in accidents was the geared vehicle; the number of such vehicles being 865 (81%) compared to 211 (19%) non-geared vehicles. This difference was found to be statistically significant ($\chi^2 = 630.39$, $df = 1$,

Table 2

Age distribution of victims of accidents

Age	2000	2001	2002	2003	2004	Total (%)
<18y	3	2	6	7	8	26 (1.74)
18–24	20	32	47	55	58	212 (14.19)
25–34	28	48	68	64	67	275 (18.41)
35–44	31	25	55	50	53	214 (14.32)
45–54	16	19	33	29	36	133 (8.90)
≥55	9	14	19	25	23	90 (6.02)
Total	107	140	228	230	245	950

$p < 0.0001$). A significantly high number of males were involved in two wheeler accidents than females ($\chi^2 = 664$, $df = 1$, $p < 0.001$). Among the injured persons, 83% were males ($n = 1245$) and 17% ($n = 249$) females. Data regarding age was available only in 63.6% ($n = 950$) victims, this being a limitation of the study. Majority (73.7%) victims of two wheeler accidents were in age range 18–44 years, the most commonly involved age group being 25–34 years (28.9%) followed by 35–44 years (22.5%) and 18–24 years (22.3%) as seen in Table 2. It was observed that the age and sex distribution was almost constant for the last five years with no significant changes over time.

Majority of victims (64%) sustained injuries not amounting to grievous hurt as per Section 320, Indian Penal Code.¹⁵ Thirty-one percent of the victims sustained injuries amounting to grievous hurt, and 5% ($n = 75$) of the victims succumbed to the injuries sustained. Of the total number of fatalities, 60% ($n = 45$) died on the spot. In our study, nearly three-fourth of the two wheeler accidents ($n = 915$) were reported between 10 am and 10 pm. The number of accidents increased as the day progressed and maximum number of two wheeler accidents (27.4%) occurred in between 6 pm and 10 pm. Most number of two wheeler accidents took place in the month of October (10.6%) followed by in the months of November (10.3%) and September (9.2%). The month-wise distribution of two wheeler accidents is depicted in Fig. 1. The year was divided into three seasons prevalent in this coastal city viz; summer (February–May, pre monsoon months), rainy (June–September, monsoon months), and winter (October–January, post monsoon months). A large number of the accidents (38.7%) took place during the post monsoon months.

4. Discussion

Every road traffic injury case has medicolegal elements involved.¹⁶ In India, as per law, every road traffic injury case is registered as a medicolegal case and investigated for prosecution concerns and compensation needs.⁴ Over 80,000 people die in traffic crashes annually, over 1.2 million are injured seriously and about 3,00,000 disabled permanently in India.¹⁷ In the present study it was observed that there has been an increase in the number of two wheeler accidents and total accidents over the past years. Two wheeler accidents have increased from 193 in the year 2000 to 290 in the year 2004, a rise of more than 50%. The geared vehicle was the most commonly involved type of two wheeler in accidents (81%). This may be because of the high number of geared vehicles in the city that are preferred over non-geared ones especially by the youngsters. Contrary to our finding, Jha et al. found that among two wheeler accidents mopeds were more commonly involved in a study at Pondicherry.¹⁸ This could be due to the fact that the study was from a semi urban area where mopeds form a major fraction of the two wheelers present. In India increasing use of two wheelers has been attributed to cheaper costs, and as a solution to traffic congestion and jams during peak hours and on busy urban roads.

Table 1

Traffic accidents and distribution of victims in two wheeler accidents at Mangalore, Southern India

	2000	2001	2002	2003	2004	Total (%)
Accidents						
Total	539	578	602	648	573	2940
Two wheeler	193	234	266	248	290	1231
(percent of total)	(35.8)	(40.5)	(22.2)	(38.3)	(50.6)	(41.9)
Victim						
Rider	126	146	168	136	191	767 (51.3)
Pillion	47	48	60	79	76	310 (20.8)
Pedestrian	60	67	101	105	84	417 (27.9)
Total	233	261	329	320	351	1494 (100)

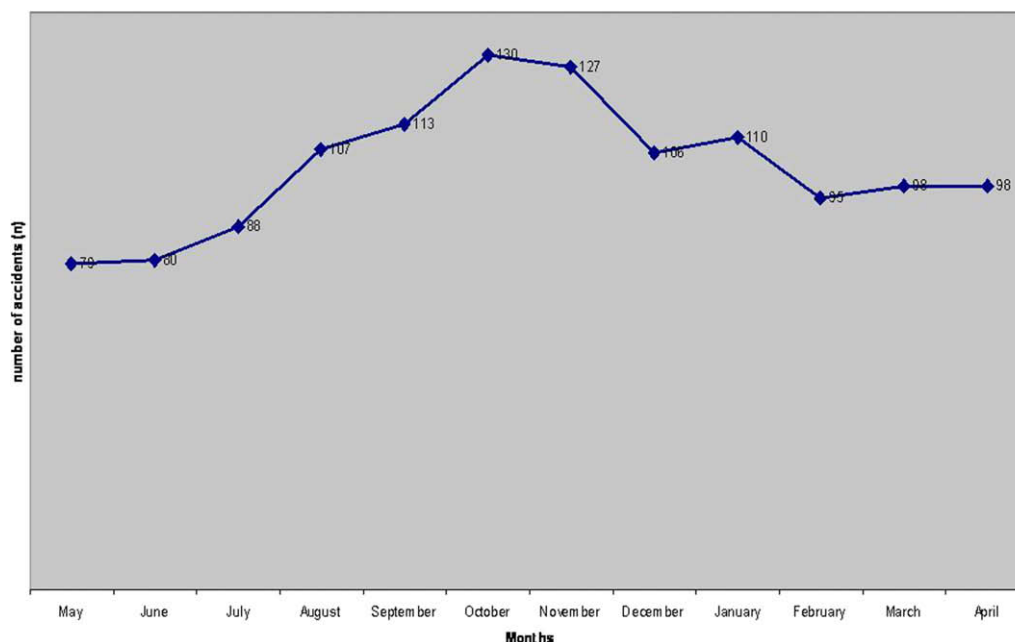


Fig. 1. Month-wise distribution of two wheeler accidents.

Majority of the victims of two wheeler accidents were males. Males predominated over females in the ratio 5:1. Similar findings have been reported by several researchers.^{10,18–23} Ghosh, however, has reported a very high male: female ratio (9:1) in a study conducted at Delhi.²¹ The most commonly involved age group in two wheeler accidents was 25–34 years followed by 35–44 years and 18–24 years. Mangalore has a large number of students coming from various parts of the country and there is an increasing trend towards owning a two wheeler especially motorized geared bike among this section of population. Similar findings have also been reported by other researchers.^{10,18–23} In a study in central India three-fourth of the victims was in the age group 18–37 years.²² The young and middle aged are mostly students and working people and need to travel more often on roads. This may result in more exposure and vulnerability of this age group.¹⁰ Most of the work force of a nation belongs to this age group. Road traffic injuries are among the second to sixth leading cause of death in the age group 15–60 years in all countries of the South East Asia region.¹⁷ The few victims aged below 18 years were either pillion riders or pedestrians.

The maximum number of two wheeler accidents during late evening might be because the traffic density is high during this time¹⁰ and is coupled with the poor infrastructure and fall in traffic discipline. Ghosh found that the periods between 9 am and 12 noon and 6 pm and 9 pm were the most common time of occurrence of accidents.²¹ Regarding the seasonal distribution of accidents, May and June are the months when most of the schools and educational institutes are closed on vacations thus decreasing the vehicular burden on the roads. The increase in accidents during post monsoon months may be due to the increase in number of two wheeler traffic on road following the monsoon months of June–September. Deterioration of roads during monsoon months/rainy season may also be responsible for rise in number of accidents during post monsoon months.

It was observed that in majority of cases the victim was a two wheeler rider. The pillion riders and the pedestrians were affected to a lesser extent. The riders often ignore safety measures, making them more vulnerable to accidents. Absence of safety awareness and absence of pedestrian walkways and sub ways increase the

vulnerability of pedestrians to accidents. Dandona and Mishra in a study at Hyderabad had found that pedestrians and riders of two wheelers were the main victims in road traffic crashes.²⁰ However, Jha et al. have reported injuries only in 2% of pillion riders. Majority of the accidents involving two wheelers in this study were non-fatal resulting in simple injury (64%). Jha et al. have reported similar results.¹⁸ Thirty-one percent of the accidents resulted in grievous injury whereas 5% of the total two wheeler accidents were fatal. However, it is important to note that of all fatalities, 60% of the victims died on the spot, 20% on the way to hospital and the remaining 20% succumbed to injuries in the hospital. These findings are very similar to those reported by other researchers.^{10,20} This observation calls for an increased awareness among the general public as well as a well-developed accident and trauma management and response system equipped with modern ambulance manned by trained personnel. To conclude, accidents and injuries are on a rise during last five years which is a cause of concern. Though there may be some under-reporting of minor accidents, and the data in this study may not be exhaustive and complete as some accidents do not come to the notice of police, yet it does give us an indication of the magnitude of the problem. Data collection system needs to be strengthened in developing countries like India, and involvement of all the stakeholders is recommended so that more effective research and planning of preventive strategies are possible. There should also be a standard and comprehensive format which should record all the information about an accident along with a co-ordination between the hospitals and the investigating agencies. Another limitation of this study was that data regarding mortality rate, period of survival, management of victims could not be taken into account as this was a retrospective record based study from the traffic police records.

However, the limitations notwithstanding, in the light of the findings of this study, it is recommended that education regarding road safety should be imparted especially to the young age group. They should be made aware of the traffic rules and urged to strictly follow traffic rules. Construction of properly planned roads and over-bridges to cope up with the increasing burden of vehicles with emphasis on lane driving will help the cause. Speed limit should be strictly enforced in accident-prone areas. Efforts should

be made to reduce congestion on road particularly during rush hours and especially in the zones prone for accidents. Periodic surveillance and repair of roads especially after rainy season is suggested in this region. Use of helmets should be made mandatory not only for the rider but also for the pillion. For pedestrians, there should be complete segregation by providing sidewalks on both sides of the road. Measures like 'zebra crossing' and construction of over-pass or sub-way if feasible can go a long way in reducing morbidity and mortality among pedestrians. Analysis of pattern of injuries is another essential criterion for planning emergency trauma care. An elaborate analysis on this aspect is proposed and is a topic for future regional research.

Conflict of interest statement

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